

AMENDMENT TO THE CLAIMS:

Please cancel claims 3 and 4 without prejudice, please amend claims 1 and 2 and please add new claims 5, 6, 7 and 8 as follows:

1 (Currently amended). A method for measuring the operating state of a synchronous motor by using a composite power angle meter, wherein the method ~~comprising~~ comprises the steps of:

5 a. using the composite power angle meter to obtain stator voltage and current signals, a magnetic excitation voltage and current signals, a magnetic excitation adjustment signal and a system voltage signal of the synchronous motor in real time;

 b. performing internal controlling programs to calculate parameters of the synchronous motor in real time;

10 c. depicting various electric and mechanical model graphs as well as end composite magnetic leakage graph of the synchronous motor, and displaying the graphs on a display; and wherein the steps for depicting images of composite power angle graph of a non-salient-pole synchronous motor are:

15 a. ~~Obtaining various electric signals and digital signals of the synchronous motor and its system;~~

 b. ~~Converting the electric signals into digital signals by an internal data collection part of the composite power angle meter, and inputting all the obtained digital signals to a host computer;~~

20 c. ~~Inputting related parameters or commands to the host computer by keyboard and mouse;~~

 d. ~~Program processing the related data by the computer, calculating the data by a computing program to obtain the coordinates of relevant points and related data, and inputting the results to a displaying program;~~

25 e. ~~Using the coordinates of main points and the calculation results to depict an electric model graph, a mechanical model graph and a motor-end composite magnetic leakage graph of the synchronous motor through the displaying program process by the computer, displaying on a display a dynamic composite power angle graph and the motor-end composite magnetic leakage graph which vary with the motor's parameters, and realizing an alarm function.~~

30 (1) establishing image coordinates of a composite power angle graph, an electric power angle vector graph, a motor mechanical model graph, a motor mechanical model schematic graph, a synchronous composite power angle graph and a motor end composite magnetic leakage graph of a non-salient-pole synchronous motor as follows:

Composite power angle graph: $A_{10}(a, b)$, $C_{10}(e, 0)$, $D_{10}(0, 0)$, $G_{10}(a, 0)$;

Electric power angle vector graph: $A_{11}(a, b)$, $C_{11}(e, 0)$, $D_{11}(0, 0)$;

35 Motor mechanical model graph: $A_{12}(\frac{a}{2}, \frac{b}{2})$, $C_{12}(\frac{e}{2}, 0)$, $D_{12}(0, 0)$, $A_{13}(-\frac{a}{2}, -\frac{b}{2})$, $C_{13}(-\frac{e}{2}, 0)$;

Motor mechanical model schematic graph: $A_{14}(a, b)$, $C_{14}(e, 0)$, $D_{14}(0, 0)$;

Synchronous composite power angle graph: $A_{15}(h, i)$, $C_{15}(j, 0)$, $D_{15}(0, 0)$;

Motor end composite magnetic leakage graph: $T_{22}(0, 0)$, $X_{22}(X_1, Y_1)$, $Y_{22}(X_2, Y_2)$, $Z_{22}(X_3, Y_3)$;

40 wherein the electric power angle vector graph is the power angle vector graph of the non-salient-pole synchronous motor within the electric machine theory; vector vertexes of magnetic excitation potential in the power angle vector graph of the non-salient-pole synchronous motor have the same planar coordinates as points A_{10} , A_{11} and A_{14} ; vector vertexes of the motor end voltage in the power angle vector graph of the non-salient-pole synchronous motor have the same planar coordinates as points C_{10} , C_{11} and C_{14} ; vector vertexes of the power angle in the power angle vector graph of the non-salient-pole synchronous motor have the same planar coordinates as points D_{10} , D_{11} , D_{12} and D_{14} ; coordinates value of point A_{12} is half of the planar coordinates value of the vector vertex of the magnetic excitation potential in the power angle vector graph of the non-salient-pole synchronous motor; coordinates value of point C_{12} is half of the planar coordinates value of the vector vertex of the motor end voltage in the power angle vector graph of the non-salient-pole synchronous motor; distance between point A_{15} and point D_{15} represents synchronous end voltage of the synchronous motor; distance between point C_{15} and point D_{15} represents synchronous system voltage;

50 (2) wherein in a gist of imaging :

55 a) the coordinate points in each figure only integrate with the present figure and only image in the present figure, the image moving smoothly;

b) with respect to an axial center of the rigid body of the synchronous motor rotor,

depicting circles by taking points D_{10} , D_{12} , D_{14} and D_{15} respectively as the center of the circle and taking 1/20 of the length of the segment $C_{10}D_{10}$ obtained when the synchronous motor is under rated operation as the radius; and the circles are in white;

60 c) with respect to the rigid body of the synchronous motor rotor, depicting circles by taking points D_{10} , D_{12} , D_{14} and D_{15} respectively as the center of the circle and taking 1/5 of the length of the segment $C_{10}D_{10}$ obtained when the synchronous motor is under rated operation as the radius; the intersection portions of the rotor rigid body circles with the rotor rigid body axial center circles are still in white, and other portions are in dark blue;

65 d) wherein a lever of the synchronous motor rotor is in dark blue, the same color as the rotor rigid body, and the line width of the lever is the same as the diameter of the axial center circle; the intersection portion of the lever with the rotor axial center is still in white;

70 wherein points D_{10} and A_{10} , points A_{12} and A_{13} , points A_{14} and D_{14} and points A_{15} and D_{15} are connected by levers respectively;

75 e) with respect to the stator rigid body, depicting a circle by taking point D_{12} as the center of the circle and taking the 1/3 length of the segment $C_{10}D_{10}$ obtained when the synchronous motor is under rating operation as the radius; the portion out of the intersection portion of this circle with the rotor rigid body circle, the rotor axial center circle and the rotor lever is in light grey;

80 wherein points C_{10} and D_{10} , points C_{14} and D_{14} , and points C_{15} and D_{15} are connected by thin real line respectively, and at both ends of the segments there are prolongations as long as 1/2 length of the segment $C_{10}D_{10}$ obtained when the synchronous motor is under rated operation; the intersection portions with the rotor rigid body circle and the rotor axial center circle are represented by dotted lines; the part under the thin real line is shadowed with parallel thin-short bias, while the rotor rigid body circle and the rotor axial center circle are not shadowed;

85 f) wherein the stator lever is connected between points C_{12} and C_{13} with the same width as that of the rotor lever and the same color as that of the stator rigid body, and its intersection portion with the rotor rigid body circle and the rotor axial center circle is still in the color of the rotor rigid body circle and the rotor axial center circle;

 wherein points C_{10} and D_{10} , points C_{14} and D_{14} , and points C_{15} and D_{15} are connected by black bold lines representing levers, the width of the bold line is the radius of the axial center

circle, and its intersection portion with the rotor axial center circle and the rotor rigid body circle is represented by thin dotted line;

90 g) wherein a spring is in black; the spring being visualized to extend and shrink according to the lengthening and shortening of the spring; and wherein there is an obvious joint between the spring and the lever;

 wherein points A_{10} and C_{10} , points A_{12} and C_{12} , points A_{13} and C_{13} , and points A_{14} and C_{14} are connected with springs respectively;

95 h) wherein a joint between the spring and the lever is represented by a white circle, the diameter of the circle is slightly shorter than the diameter of the lever, the circle is positioned at the axial centers of the lever and the spring, and its connection with the spring is obviously visualized; the distances from the center of the circle on top of the lever representing the joint to both sides of the lever equal to the distances from the center to the ends of the lever respectively;

100 i) wherein in segments, points A_{10} and G_{10} and points C_{10} and G_{10} are connected by thin black lines respectively;

105 j) wherein vectors are depicted by linking points D_{11} and A_{11} by a segment with an arrow pointing to A_{11} ; linking points D_{11} and C_{11} by a segment with an arrow pointing to C_{11} ; linking points C_{11} and A_{11} by a segment with an arrow pointing to C_{11} ; points T_{22} and X_{22} are linked by a black bold segment with an arrow pointing to X_{22} ; points T_{22} and Y_{22} are linked by a black bold segment with an arrow pointing to Y_{22} ; points T_{22} and Z_{22} are linked by a colorful bold segment with an arrow pointing to Z_{22} ; points X_{22} and Z_{22} and points Y_{22} and Z_{22} are linked by black thin dotted segments respectively;

 k) wherein the marks of the coordinate points are:

110 A_{10} for “ E_0 ”, point C_{10} for “U”, point D_{10} for “O”, and point G_{10} for “M”;

Point A_{11} for “ \dot{E}_0 ”, point C_{11} for “ \dot{U} ”, and point D_{11} for “O”; segment $A_{11}C_{11}$ for “ \dot{E}_a ”;

Point A_{15} for “ E_0 ”, point C_{15} for “U”, and point D_{15} for “O”;

wherein the marks move with the moving of the positions of the coordinate points, and the relative positions of the marks and corresponding coordinate points keep constant;

115 l) wherein the dotted line representing the power angle passes through the center of the rotor, superposing the axial center of the lever, and being not longer than 1/3 of the length of

segment $C_{10}D_{10}$ obtained when the synchronous motor is under rating operation; it is marked as “ δ ” within the range of the power angle, the levers at both sides of the power angle are connected by an arc, the vertex of the arc varies as the positions of the levers vary, the radius of the arc is longer than the radius of the rotor rigid body circle, and the center of the arc superposes the stator axial center;

120 m) marking the abrupt change of the magnetic excitation potential or the amount of the magnetic excitation adjustment in the composite power angle graph;

125 n) with respect to a PQ curve in the composite power angle graph: determining the PQ curve according to the end heat-emitting limit of the synchronous motor, the greatest operation power angle of the synchronous motor that the system permits, the greatest active power that the synchronous motor permits, the greatest stator magnetic flux, the greatest stator current and the greatest stator potential that the synchronous motor permits, and the greatest rotor magnetic flux, the greatest rotor current and the greatest rotor voltage that the synchronous motor permits;

130 o) wherein a composite magnetic leakage alarm circle is depicted by depicting a circle by taking T_{22} as the center of the circle and taking the greatest magnetic leakage flux that the synchronous motor permits as the radius; this circle is the alarm circle, which is represented by a colorful bold curve;

135 p) wherein the synchronous image requirements are depicted by depicting dotted circles by taking point D_{15} as the center of the circle and taking segments $D_{15}A_{15}$ and $D_{15}C_{15}$ as the radius respectively;

q) wherein the motor mechanical model simulates a real motor to rotate dynamically;

r) wherein an image alarm display is given on electric parameters or magnetic flux,

140 the marks turn to red flickers, the speaker of the computer whistles, and the corresponding segments in the composite power angle graph and its sub-figures and the magnetic leakage graph turn to red flickers; and when the alarm is relieved, the alarm marks or segments stay red but without flicker; and

145 s) wherein in accordance with requirements of the user, adjustments are made within a small range on the stator radius and rotor radius, the axial center radius of the stator and of the rotor, the diameter of the lever and the spring joint radius of the synchronous motor, which are

given by the gist of imaging in the composite power angle graph and its sub-figures; the mechanical model graphs are made as three-dimensional mechanical model graphs; and the color of the models is adjusted.

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2. (Currently amended) The A method for measuring the operating state of synchronous motor by using the composite power angle meter according to Claim 1, wherein the displaying program process comprises establishing coordinates of images and imaging; and the computing program process comprises determining parameters, calculating parameters, determining the value of the direct axis synchronous reactance of the synchronous motor and alarming, and wherein the method comprises the steps of:

a. using the composite power angle meter to obtain stator voltage and current signals, a magnetic excitation voltage and current signals, a magnetic excitation adjustment signal and a system voltage signal of the synchronous motor in real time;

10 b. performing internal controlling programs to calculate parameters of the synchronous motor in real time;

c. depicting various electric and mechanical model graphs as well as end composite magnetic leakage graph of the synchronous motor, and displaying the graphs on a display; and wherein the steps for depicting images of composite power angle graph of a salient-pole synchronous motor are:

(1) establishing image coordinates of a composite power angle graph, an electric power angle vector graph, a motor mechanical model graph, a motor mechanical model schematic graph, a synchronous composite power angle graph and a motor end composite magnetic leakage graph of the salient-pole synchronous motor as follows:

20 Composite power angle graph: $A_0(a, b)$, $B_0(c, d)$, $C_0(e, 0)$, $D_0(0, 0)$, $E_0(f, g)$, $F_0(f, 0)$, $G_0(c, 0)$;

Electric power angle vector graph: $A_1(a, b)$, $C_1(e, 0)$, $D_1(0, 0)$, $E_1(f, g)$;

Motor mechanical model graph: $A_2(\frac{a}{2}, \frac{b}{2})$, $B_2(\frac{c}{2}, \frac{d}{2})$, $C_2(\frac{e}{2}, 0)$, $D_2(0, 0)$, $E_2(\frac{f}{2}, \frac{g}{2})$, $A_3(-\frac{a}{2}, -\frac{b}{2})$, $B_3(-\frac{c}{2}, -\frac{d}{2})$, $C_3(-\frac{e}{2}, 0)$, $E_3(-\frac{f}{2}, -\frac{g}{2})$;

25 Motor mechanical model schematic graph: $A_4(a, b)$, $B_4(c, d)$, $C_4(e, 0)$, $D_4(0, 0)$, $E_4(f, g)$;

Synchronous composite power angle graph: A₅(h, i), C₅(j, 0), D₅(0, 0);

Motor end composite magnetic leakage graph: T₂₀(0, 0), X₂₀(X₁, Y₁), Y₂₀(X₂, Y₂), Z₂₀(X₃, Y₃);

wherein the electric power angle vector graph is the power angle vector graph of the salient-

30 pole synchronous motor within the electric machine theory; vector vertexes of magnetic excitation potential in the power angle vector graph of the salient-pole synchronous motor have the same planar coordinates as points A₀, A₁ and A₄; vector vertexes of the motor end voltage in the power angle vector graph of the salient-pole synchronous motor have the same planar coordinates as points C₀, C₁ and C₄; vector vertexes of the power angle in the power angle vector graph of the salient-pole synchronous motor have the same planar coordinates as points D₀, D₁,

35 D₂ and D₄; coordinates value of point A₂ is half of the planar coordinates value of the vector vertex of the magnetic excitation potential in the power angle vector graph of the salient-pole synchronous motor; coordinates value of point C₂ is half of the planar coordinates value of the vector vertex of the motor end voltage in the power angle vector graph of the salient-pole

40 synchronous motor; distance between point A₅ and point D₅ represents synchronous end voltage of the synchronous motor; distance between point C₅ and point D₅ represents synchronous system voltage;

(2) wherein in a gist of imaging

45 a) the coordinate points in each figure only integrate with the present figure and only image in the present figure, the image moving smoothly;

b) with respect to an axial center of a rigid body of the synchronous motor rotor: depicting circles by taking points D₀, D₂, D₄ and D₅ respectively as the center of the circle and taking 1/20 of the length of the segment C₀D₀ obtained when the synchronous motor is under rated operation as the radius;

50 c) with respect to the rigid body of the synchronous motor rotor: depicting circles by taking points D₀, D₂, D₄ and D₅ respectively as the center of the circle and taking 1/4 of the length of the segment C₀D₀ obtained when the synchronous motor is under rating operation as the radius;

55 d) wherein for a lever of the synchronous motor rotor: the lever is in dark blue, the same color as the rotor rigid body, and the line width of the lever is the same as the diameter of

the axial center circle; when the rotor lever is a T-shaped lever, the length of the top beam of the T-shaped lever in each of the composite power angle graph, motor mechanical model schematic graph and synchronous composite power angle graph is two times as much as the length of the segment D_0C_0 obtained when the synchronous motor is under rating operation, and the top beam is central-positioned; the length of the top beam of the T-shaped lever in the motor mechanical model graph is two times as much as the length of the segment D_2C_2 obtained when the synchronous motor is under rating operation, and the top beam is central-positioned;

60 Points D_0 and A_0 , points A_3 and A_2 , points D_4 and A_4 and points D_5 and A_5 are connected by levers respectively;

65 e) with respect to the stator rigid body: depicting a circle by taking point D_2 as the center of the circle and taking the 1/3 length of the segment C_0D_0 obtained when the synchronous motor is under rated operation as the radius;

70 Points C_0 and D_0 , points C_4 and D_4 , and points C_5 and D_5 are connected by thin real line respectively, and at both ends of the segments there are prolongations as long as 1/2 length of the segment C_0D_0 obtained when the synchronous motor is under rating operation; the intersection portions with the rotor rigid body circle and the rotor axial center circle are represented by dotted lines; the part under the thin real line is shadowed with parallel thin-short bias, while the rotor rigid body circle and the rotor axial center circle are not shadowed;

75 f) wherein the stator lever is connected between points C_2 and C_3 with the same width as that of the rotor lever; points C_0 and D_0 , points C_4 and D_4 , and points C_5 and D_5 are connected by black bold lines representing levers, the width of the bold line is the radius of the axial center circle, and its intersection portion with the rotor axial center circle and the rotor rigid body circle is represented by thin dotted line;

80 g) wherein a spring is in black; the spring being visualized to extend and shrink according to the lengthening and shortening of the spring; and wherein there is an obvious joint between the spring and the lever;

Points B_0 and C_0 , points E_0 and C_0 , points B_2 and C_2 , points E_2 and C_2 , points B_3 and C_3 , points E_3 and C_3 , points B_4 and C_4 , and points E_4 and C_4 are connected with springs respectively;

85 h) with respect to a joint between the spring and the lever: the joint between the

spring and the lever is represented by a white circle, the diameter of the circle is slightly shorter than the diameter of the lever, the circle is positioned at the axial centers of the lever and the spring, and its connection with the spring is obviously visualized; the distances from the center of the circle on top of the lever representing the joint to both sides of the lever equal to the distances from the center to the ends of the lever;

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i) wherein in segments, points E_0 and F_0 , points B_0 and G_0 , and points C_0 and G_0 are connected by thin black lines respectively;

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j) wherein vectors are depicted linking points D_1 and A_1 by a segment with an arrow pointing to A_1 ; linking points E_1 and A_1 by a segment with an arrow pointing to A_1 ; linking points C_1 and E_1 by a segment with an arrow pointing to E_1 ; linking points D_1 and C_1 by a segment with an arrow pointing to C_1 ; segment E_1A_1 is under segment D_1A_1 ; points T_{20} and X_{20} are linked by a black bold segment with an arrow pointing to X_{20} ; points T_{20} and Y_{20} are linked by a black bold segment with an arrow pointing to Y_{20} ; points T_{20} and Z_{20} are linked by a colorful bold segment with an arrow pointing to Z_{20} ; points X_{20} and Z_{20} and points Y_{20} and Z_{20} are linked by black thin dotted segments respectively;

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k) wherein the marks of the coordinate points are:

Point A_0 for " E_0 ", point B_0 for " E_d ", point C_0 for "U", point D_0 for "O", point E_0 for " E_q ", point F_0 for "M", and point G_0 for "N";

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Point A_1 upper for " \dot{E}_0 ", lower for " \dot{E}_d ", point C_1 for " \dot{U} ", point D_1 for "O", and point E_1 for " \dot{E}_q ";

Point A_5 for " E_0 ", point C_5 for "U", and point D_5 for "O"; and

wherein the marks move with the moving of the positions of the coordinate points, and the relative positions of the marks and corresponding coordinate points keep constant;

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l) wherein the dotted line representing the power angle passes through the center of the rotor, superposing the axial center of the lever, and being not longer than 1/3 of the length of segment C_0D_0 obtained when the synchronous motor is under rating operation; it is marked as " δ " within the range of the power angle, the levers at both sides of the power angle are connected by an arc, the vertex of the arc varies as the positions of the levers vary, the radius of the arc is

longer than the radius of the rotor rigid body circle, and the center of the arc superposes the
115 stator axial center;

m) marking the abrupt change of the magnetic excitation potential or the amount of the magnetic excitation adjustment in the composite power angle graph;

n) with respect to a PQ curve in the composite power angle graph: determining the PQ curve according to the end heat-emitting limit of the synchronous motor, the greatest operation 120 power angle of the synchronous motor that the system permits, the greatest active power that the synchronous motor permits, the greatest stator magnetic flux, the greatest stator current and the greatest stator potential that the synchronous motor permits, the greatest rotor magnetic flux, the greatest rotor current and the greatest rotor voltage that the synchronous motor permits;

o) wherein a composite magnetic leakage alarm circle is depicted by depicting a circle 125 by taking T_{20} as the center of the circle and taking the greatest magnetic leakage flux that the synchronous motor permits as the radius; this circle is the alarm circle, which is represented by a colorful bold curve;

p) wherein the synchronous image requirements are depicted by depicting dotted circles by taking point D_5 as the center of the circle and taking segments D_5A_5 and D_5C_5 as the 130 radius respectively;

q) wherein the motor mechanical model simulates a real motor to rotate dynamically;

r) wherein an image alarm display is given on electric parameters or magnetic flux, the marks turn to red flickers, the speaker of the computer whistles, and the corresponding segments in the composite power angle graph and its sub-figures and the end composite magnetic leakage 135 graph turn to red flickers; and when the alarm is relieved, the alarm marks or segments stay red but without flicker; and

s) wherein in accordance with requirements of the user, adjustments are made on the stator radius and rotor radius, the axial center radius of the stator and of the rotor, the diameter of the lever and the spring joint radius of the synchronous motor, which are given by the gist of 140 imaging in the composite power angle graph and its sub-figures; the mechanical model graphs are made as three-dimensional mechanical model graphs; and the color of the models is adjusted.

3. (Canceled.)

4. (Canceled.)

5. (New). The method for measuring the operating state of synchronous motor by using the composite power angle meter according to Claim 1, wherein the depicted composite power angle graph of the non-salient-pole synchronous motor has double significations: in one aspect, it represents the electric power angle vector graph of the non-salient-pole synchronous motor, and
5 in another aspect, it represents the mechanical power angle graph showed with the magnetic flux:

(1) wherein the lengths of OE_0 and OU represent the magnetic excitation potential and the end voltage of the motor respectively, and E_0U , E_0M and UM represent the stator potential of the motor, the active component and reactive component of the stator potential respectively; point M on the segment OU , on the extension of the segment OU or superposing point U represent that the motor generates capacitive reactive power, inductive reactive power or zero reactive power respectively; point E_0 above, below or on line OU respectively represent that the motor is a dynamotor, is an electromotor, or has zero active power;

10 (2) wherein the lengths of OE_0 and OU represent the magnetic excitation flux lever and the total magnetic flux lever in the stator coil of the motor respectively, and E_0U , E_0M and UM represent the extended length of the mechanical lever spring of the dynamotor, the active component and reactive component of the extended length of the spring respectively; point M on the segment OU , on the extension of the segment OU or superposing point U represent that the motor generates capacitive reactive power, inductive reactive power or zero reactive power respectively; point E_0 above or below the lever OU or on the line OU respectively represent that
15 the spring has an anticlockwise torsion, has a clockwise torsion or has no torsion with respect to the stator, and that the motor operates in manner of a dynamotor, an electromotor or zero active power;

20 (3) wherein the length of UE_0 represents the value of the apparent power of the motor, and the lengths of E_0M and UM represent the values of the active power and reactive power of
25 the dynamotor respectively; and

(4) wherein the length of UE_0 represents the value of the stator current of the motor, and the lengths of E_0M and UM represent the values of the active component and reactive component of the stator current of the motor, respectively.

Claim 6 (New). The method for measuring the operating state of synchronous motor by

using the composite power angle meter according to Claim 2, wherein the depicted composite power angle graph of the salient-pole synchronous motor has double significations: in one aspect, it represents the electric power angle vector graph of the salient-pole synchronous motor, and in another aspect, it represents the mechanical power angle graph showed with the magnetic flux:

(1) wherein the lengths of OE_0 and OU represent the magnetic excitation potential and the end voltage of the dynamotor respectively, UE_q and UE_d represent the quadrature-axis component and direct-axis component of the stator potential of the synchronous motor respectively, and E_qM and MU represent the active component and reactive component of the stator quadrature-axis potential of the synchronous motor, point M on segment OU or superposing point U respectively represent that the inductive reactive power done by the quadrature-axis potential is negative or zero, point E_q above, below or on the line OU respectively represent that the active power done by the quadrature-axis potential is positive, negative or zero; E_dN and NU represent the active component and reactive component done by the stator direct-axis potential of the synchronous motor respectively, point N on the segment OU , on the extension of the segment OU or superposing point U respectively represent that the inductive reactive power done by the direct-axis potential is negative, positive or zero, and point E_d above, below or on the line OU respectively represent that the active power done by direct-axis potential is positive, negative or zero;

(2) wherein the lengths of OE_0 and OU represent the magnetic excitation flux and the total composite magnetic flux in the stator coil of the dynamotor respectively, UE_q and UE_d respectively represent the quadrature-axis component and direct-axis component of the composite magnetic flux generated by the reaction of the stator armature of the synchronous motor; and

(3) wherein the lengths of OE_0 and OU represent the rotor lever and stator lever of the synchronous motor respectively, UE_q and UE_d respectively represent the extended lengths of the springs by which the rotor lever of the synchronous motor pulls the stator lever along directions of quadrature-axis and direct-axis, and segments E_qM and E_dN respectively represent the active length components generated by the extensions of the quadrature-axis spring and direct-axis spring, anticlockwise and clockwise pulls generate positive active power and negative active power respectively, segments MU and UN respectively represent the reactive components

generated by the extensions of the quadrature-axis spring and direct-axis spring, the pull along

the direction from point O to point U generates positive inductive reactive power, and the pull

35 along the direction from point U to point O generates the negative inductive reactive power.

Claim 7 (New) The method for measuring the operating state of synchronous motor by using the composite power angle meter according to Claim 1 or 5, wherein in the image coordinates of the motor end composite magnetic leakage graph of the non-salient-pole synchronous motor,

5 Coordinate values of $T_{22}(0, 0)$, $X_{22}(X_1, Y_1)$, $Y_{22}(X_2, Y_2)$, $Z_{22}(X_3, Y_3)$ are:

$$X_1=K_1a; Y_1=K_1b; X_2=K_2(e-a); Y_2=-K_2b; X_3=X_1+X_2; Y_3=Y_1+Y_2; \text{ and}$$

wherein K_1, K_2 are prescribed values, and a, b, e are the coordinate values of the electric power angle vector graph of the non-salient-pole synchronous motor.

8. (New) The method for measuring the operating state of synchronous motor by using the composite power angle meter according to Claim 2 or 6, wherein in the image coordinates of the motor end composite magnetic leakage graph of the salient-pole synchronous motor,

5 Coordinate values of $T_{20}(0, 0)$, $X_{20}(X_1, Y_1)$, $Y_{20}(X_2, Y_2)$, $Z_{20}(X_3, Y_3)$ are:

$$X_1=K_1a; Y_1=K_1b; X_2=K_2(f-a)+K_3(c-a); Y_2=K_2(g-b)+K_3(d-b); X_3=X_1+X_2; Y_3=Y_1+Y_2; \text{ and}$$

Wherein K_1, K_2, K_3 are prescribed values, and a, b, c, d, f, g are the coordinate values of the electric power angle vector graph of the salient-pole synchronous motor.